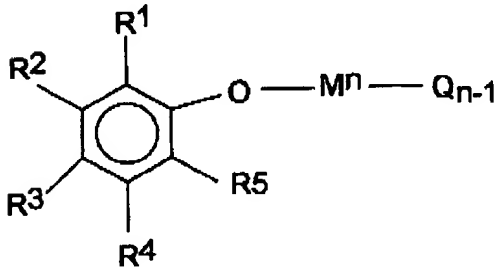
Application No.: 09/932,910
Response dated: September 15, 2003
Reply to Office Action of July 14, 2003

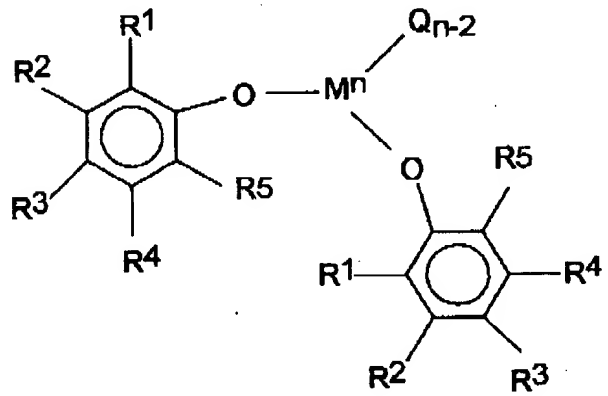
IN THE CLAIMS

Please amend the claims as follows.

1. (Currently Amended) A catalyst system comprising an activator and one or more heteroatom substituted phenoxide metal compounds wherein the metal is bound to the oxygen of the phenoxide group the compounds~~:~~
being represented by the following formulae:



or



~~provided that:~~

wherein:

R^1 , R^2 , R^4 and R^5 ~~may be~~ are independently hydrogen, a heteroatom containing group or a C_1 to C_{100} group, with the proviso that when M is titanium, the hetero atom in R^1 and R^5 is not oxygen, R^3 ~~may be~~ is hydrogen, or a C_1 to C_{100} group, provided that at least one of R^2 , R^4 or R^5 is a group containing a heteroatom, said hetero atom being selected from the group consisting of boron, aluminum, silicon, nitrogen, phosphorus, arsenic, tin, lead, antimony, ~~,~~ selenium~~,~~ and tellurium, and any of R^1 to R^5 ~~may~~ is or ~~may~~ is not ~~be~~ bound directly to the metal M,

O is oxygen,

M is a selected from the group consisting of titanium, zirconium, hafnium, chromium, molybdenum, a Group 3 , a Group 5 and a Group 7-10 transition metal or a lanthanide metal, with the proviso that M is not tungsten,

n is the valence state of M,

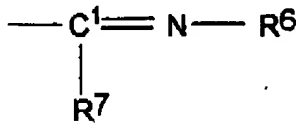
Q is an anionic ligand or a bond to an R group containing a heteroatom which may be either ~~any~~ of R^1 ~~to~~ or R^5, and

further provided that:

a) if more than one heteroatom substituted phenoxide is present it is not bridged to ~~the~~ another heteroatom substituted phenoxide,

b) if the metal is a Group 4 metal then the carbon ortho to the carbon bound to the oxygen of the phenoxide is not bound to an aldehyde or an ester,

c) the carbon ortho to the carbon bound to the oxygen of the phenoxide is not bound to the C^1 carbon in a group represented by the formula:



wherein R^6 and R^7 are independently hydrogen, halogen, a hydrocarbon group, a heterocyclic compound residue, an oxygen containing group, a nitrogen containing group, a boron containing group, a sulfur containing group, a phosphorus containing

group, a silicon containing group, a germanium containing group, or a tin containing group, and R^6 and R^7 may be bonded to each other to form a ring,

d) if the metal is a Group 4 metal ~~than~~ then the ortho and ~~metal~~ meta carbons do not form a pyridine ring, and

e) the carbon ortho to the carbon bound to the oxygen of the phenoxide is not bound to a sulfur atom directly bound to a nitrogen atom.

2. (Original) The catalyst system of claim 1 wherein the activator is selected from the group consisting of an aluminum alkyl, an alumoxane, a modified alumoxane, a borane, a borate, a non-coordinating anion or combinations thereof.

3. Cancelled

4. (Currently Amended) The catalyst system of claim 1 wherein ~~the transition metal~~ M is zirconium.

5. (Currently Amended) The catalyst system of claim 1 wherein the heteroatom substituted phenoxide ~~transition~~ metal compound is selected from the group consisting of:

bis(N-benzylidene-2-aminomethyl-4,6-di-t-butylphenoxide)zirconium(IV) dibenzyl;
bis(N-benzylidene-2-aminomethyl-4,6-di-t-butylphenoxide)zirconium(IV) dichloride;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-*t*-amylphenoxide)zirconium(IV) dibenzyl;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-*t*-amylphenoxide)zirconium(IV) dibenzyl;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-*t*-amylphenoxide)zirconium(IV) dichloride;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-*t*-amylphenoxide)zirconium(IV) di(bis(dimethylamide));
bis(2-(2H-benzotriazol-2-yl)-4,6-di-(1',1'-dimethylbenzyl)phenoxide)zirconium(IV) dibenzyl;
bis(*N*-benzylidene-2-hydroxy-3,5,di-*t*-butylbenzylamine) titanium(IV) dibenzyl;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-*t*-amylphenoxid)titanium(IV) dibenzyl;

bis(2-(2H-benzotriazol-2-yl)-4,6-di-(1',1'-dimethylbenzyl)phenoxide)titanium(IV) dibenzyl;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-(1',1'-dimethylbenzyl)phenoxide)titanium(IV) dichloride;
bis(2-(2H-benzotriazol-2-yl)-4,6-di-(1',1'-dimethylbenzyl)phenoxide)hafnium(IV) dibenzyl; and
(N-phenyl-2,4-bis(2-phenyl-2-propyl)-6-iminomethylphenoxide)zirconium(IV) tribenzyl.

6. (Previously Presented) The catalyst system of claim 5 wherein said activator comprises one or more of an aluminum alkyl, an alumoxane, a modified alumoxane, a borane, a borate or a non-coordinating anion.

7. (Currently Amended) The catalyst system of claim 1 wherein ~~either~~ the transition metal compound, or the activator, or both are placed on a support.

8. (Original) The catalyst system of claim 1 further comprising a Ziegler-Natta catalyst.

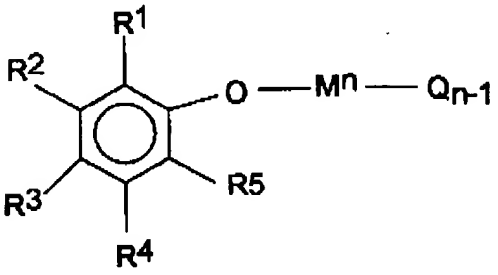
9. (Original) The catalyst system of claim 1 further comprising a mono-or bis-cyclopentadienyl Group 4, 5 and 6 transition metal compound and an optional second activator.

10. (Original) The catalyst system of claim 1 further comprising a second activator.

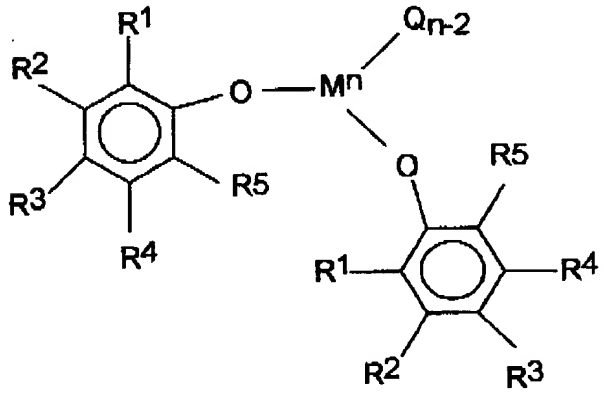
11. (Currently Amended) The catalyst system of claim 1 wherein the activator is one or more of an alumoxane, tris(2,2',2"-nonafluorobiphenyl)aluminum, triphenyl boron, triethyl boron, tri-n-butyl ammonium tetraethylborate, a triaryl borane, tri (n-butyl)

ammonium tetrakis (pentafluorophenyl) boron, trisperfluorophenyl boron, or diethylaluminum chloride.

12. (Currently Amended) A catalyst system comprising the reaction product of an activator and one or more heteroatom substituted phenoxide transition metal compounds represented by the following formulae:



or



wherein:

R^1 ~~,~~ ~~to~~ R^2 , R^4 and R^5 ~~is~~ are independently hydrogen, a heteroatom containing group or a C_1 to C_{100} group, with the proviso that when M is titanium, the hetero atom in R^1 and R^5 is not oxygen, R^3 is hydrogen, or a C_1 to C_{100} group, provided that at least one of R^2 , R^4 or ~~to~~ R^5 is a group containing a heteroatom, said hetero atom being selected from the group consisting of boron, aluminum, silicon, nitrogen, phosphorus, arsenic, tin, lead, antimony,

~~,~~selenium~~,~~ and tellurium, and any of R^1 to R^5 is or is not ~~be~~ bound directly to the metal M,

O is oxygen,

M is a selected from the group consisting of titanium, zirconium, hafnium, chromium, molybdenum, a Group 3, a Group 5 and a Group 7-10 transition metal or a lanthanide metal, with the proviso that M is not tungsten,

n is the valence state of M,

Q is an anionic ligand or a bond to ~~any~~ either of R^1 ~~to~~ or R^5 containing a heteroatom, and

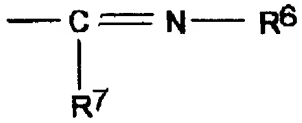
further provided that:

a) if M is a Group 4 metal then R^3 is not an aldehyde or an ester group ;

b) the R^4 and R^5 groups do not form part of a pyridine ring in the first formula if M is a Group 4 metal;

c) the R^4 and R^5 groups do not form pyridine in at least one ring of the second formula if M is a group 4 metal; and

d) neither R^1 nor R^5 may be a group represented by the formula:



wherein R^6 and R^7 are independently hydrogen, halogen, a hydrocarbon group, a heterocyclic compound residue, an oxygen containing group, a nitrogen containing group, a boron containing group, an sulfur containing group, a phosphorus containing group, a silicon containing group, a germanium containing group, or a tin containing group, and R^6 and R^7 may be bonded to each other to form a ring.

13. (Original) The catalyst system of claim 12 wherein the activator is an aluminum alkyl, an alumoxane, a modified alumoxane, a borane, a borate, a non-coordinating anion or a mixture thereof.

14. Cancelled

15. (Original) The catalyst system of claim 12 wherein the heteroatom containing group is a triazole or an oxyzole.

16. (Original) The catalyst system of claim 12 wherein the heteroatom in the heteroatom containing group is nitrogen and/or oxygen.

17. (Original) The catalyst system of claim 12 wherein the R^1 group is a C_4 to C_{20} alkyl group.

18. (Original) The catalyst system of claim 12 wherein R^1 is a tertiary alkyl group.

19. (Original) The catalyst system of claim 12 wherein R^5 is bound to the metal.

20. (Original) The catalyst system of claim 12 wherein the R^2 group is a butyl, isobutyl, tertiary butyl, pentyl, hexyl, heptyl, isohexyl, octyl, isooctyl, decyl, nonyl, or dodecyl group.

21. (Currently Amended) The catalyst system of claim 12 wherein two or more R^1 to R^5 groups ~~have formed~~ form a five or six membered ring.

22. (Currently Amended) The catalyst system of claim 12 wherein two or more R^1 to R^5 groups ~~have formed a multi-ring system~~ form a fused-ring system.

23. (Original) The catalyst system of claim 12 wherein M is zirconium, titanium or hafnium.

24. (Original) The catalyst system of claim 12 wherein n is 4.

25. (Original) The catalyst system of claim 12 wherein n is 3.

26. (Original) The catalyst system of claim 12 wherein Q is a halogen or an alkyl group.

27. (Original) The catalyst system of claim 12 wherein Q is an amide, carboxylate, carbamate, thiolate, hydride or alkoxide group.

28. (Original) The catalyst system of claim 12 further comprising a support.

29. (Currently Amended) The catalyst system of claim 12 wherein ~~either~~ the transition metal compound, ~~or~~ the activator or ~~the~~ their reaction product thereof are placed on a support selected from the group consisting of talc~~,~~, silica, magnesium chloride, alumina, silica-alumina~~;~~, polyethylene, polypropylene, polystyrene~~;~~, or a mixture thereof.

30. (Previously Presented) The catalyst system of claim 12 wherein prior to being combined with the transition metal compound and/or the activator and/or the reaction product thereof a support is partially or completely dehydrated.

31. (Previously Presented) The catalyst system of claim 12 wherein the transition metal compound and the activator are combined in molar ratios of about 1000:1 to about 0.5:1.

32. (Previously Presented) The catalyst system of claim 12 wherein the transition metal compound and the activator are combined in molar ratios of about 300:1 to about 1:1.

33. (Previously Presented) The catalyst system of claim 12 wherein the activator is a borane and the transition metal compound and the borane are combined in molar ratios of about 1:1 to about 10:1

34. (Previously Presented) The catalyst system of claim 12 wherein the activator is an alkyl aluminum compound and the transition metal compound and the alkyl aluminum compound are combined in molar ratios of about 0.5:1 to about 10:1

35. (Previously Presented) The catalyst system of claim 12 wherein two or more R^1 to R^5 groups do not form a five membered ring.

36. (Original) The catalyst system of claim 13 wherein M is zirconium.